Chapter 3.1.

Gastric cancer in Africa, with a focus on Nigeria and Zambia

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Summary

- Gastric cancer is one of the leading causes of cancer mortality globally, but in Africa the exact rates are unknown.
- Nigeria and Zambia, both sub-Saharan African countries, do not have active population-based gastric cancer prevention programmes. However, what is within reach are strategies enabling eradication of *H. pylori* infection, which is a very common infection in both countries.
- Efforts are under way to improve data collection and to streamline optimal therapies for *H. pylori* eradication, guided by systematically obtained robust evidence.

This chapter summarizes and outlines past research on gastric cancer and *H. pylori* infection in two countries in sub-Saharan Africa: Nigeria and Zambia. It also highlights some ongoing projects and probable future prospects.

3.1.1 Gastric cancer incidence and mortality rates

Gastric cancer is the ninth most common cancer type in Africa. The estimated age-standardized rates (ASRs) are 4.0 per 100 000 person-years for incidence and 3.5 per 100 000 person-years for mortality [1]. It is projected that by 2045 the gastric cancer incidence rate in Africa will increase by more than 100% [1]. However, data on gastric cancer in Africa are estimates, because most countries do not have high-quality population-wide cancer registries [2]. This section provides an overview of gastric cancer in Africa, focusing on Nigeria and Zambia.

In Nigeria, gastric cancer is the 10th most common cancer type. The estimated ASRs are 1.8 per 100 000 person-years for incidence and 1.6 per 100 000 person-years for mortality [1, 3]. In Nigeria, gastric cancer accounted for 1.6% to 4.5% of all cancers reported in various studies in 1989–2010 [4, 5]. The relative frequency ratio of gastric

cancer ranged between 1.3% and 3.6% of all cancers, and it accounted for 14% to 48.4% of all gastrointestinal malignancies [6]. The incidence of gastric cancer in Nigeria has been reported to be higher in the southern regions of the country than in the northern regions [7–9]. Although the northern regions have a higher prevalence of *H. pylori* infection than the southern regions, access to diagnostic facilities is better in the southern regions, resulting in higher detection rates for gastric cancer cases [7, 10]. In Nigeria, a high proportion of patients with gastric cancer present with stage III and stage IV disease: 97% in the North West region, 94.3% in the North Central region, and 100% in a recent 15-year prospective study in the South West region [7, 8, 11]. Only a small percentage of patients with gastric cancer (2.6% to 5.6%) have been reported to present with early-stage disease [4, 7, 9].

In Zambia, gastric cancer is the eighth most common cancer type, with an estimated ASR of 3.9 per 100 000 person-years for incidence [1, 3]. It is projected that by 2050 the gastric cancer incidence rate in Zambia will increase by more than 150% [1, 3]. Endoscopy records in Zambia revealed a statistically significant increase in the number of gastric cancer cases over a period of 43 years (1977–2021) [12]. However, it remains unclear whether this finding reflects a true increase in gastric cancer incidence rates or is merely a reflection of better diagnostic and case-detection capabilities. There is growing evidence that current figures for gastric cancer incidence rates in Zambia are underestimates. An audit of records at the University Teaching Hospital in Lusaka, which is the largest referral hospital in the country, revealed that only 42% of clinically diagnosed cases of gastric cancer were included in the Zambia National Cancer Registry, which is the source for global estimates [13]. In the absence of a population-based cancer registry and good data management systems, the true burden of gastric cancer in Zambia is not known.

The estimated ASR for gastric cancer mortality in Zambia is 3.4 per 100 000 person-years [1, 3]. According to a hospital-based audit of gastric cancer outcomes in the country, the average survival rate after 1 year was 15% [14]. These poor outcomes were attributed mostly to late diagnosis, which was believed to be compounded by delays within the health-care system rather than being attributable to late patient presentation. This was the conclusion of a study in Lusaka in 2019, which found that the median time from onset of symptoms to endoscopic diagnosis of gastric cancer was 12 weeks (interquartile range, 4–32 weeks), although patients had their first consultation within 2 weeks (interquartile range, 0–4 weeks) of noticing symptoms [15]. The delay in

diagnosis was a result of a lack of endoscopy facilities in many parts of the country and difficulties faced by patients when travelling to health-care centres with more advanced facilities. In addition, the lack of specific symptoms for early gastric cancer posed a challenge to health-care providers, who had to decide when to send patients to centres with the facilities to carry out endoscopy, which were located at a distance from where the patients lived [15].

3.1.2 Age of onset and sex ratios of gastric cancer

In Nigeria, several studies have reported that the period of the fifth and sixth decades of life was the most common age of onset for gastric cancer, and the male-to-female ratio for gastric cancer in different studies ranged from 1.2:1 to 4:1 [4, 5, 7, 9, 11, 16–19].

In contrast, in Zambia, reports showed that about 25% of gastric cancer cases are detected in people younger than 45 years, which is considered to be early-onset gastric cancer. A crude analysis suggested that this high proportion of early-onset gastric cancer in Zambia was not due to the country's young population structure [20]. However, there has not been a systematically conducted population-wide analysis to confirm this finding. Therefore, it remains unclear to what extent the early onset of gastric cancer in Zambia could be explained by the young population structure of the country. In addition, there is little evidence of familial gastric cancer syndromes in Zambia. Studies have revealed that very low percentages of patients with gastric cancer have a family history of the disease [21]. In addition, only one third of the patients diagnosed with gastric cancer had the histologically diffuse type of gastric cancer, which is the type that is most associated with familial syndromes [21]. Further investigations are needed to validate these observations and to determine the factors driving the early onset of gastric cancer in Zambia. According to the Zambia National Cancer Registry, the male-to-female ratio for gastric cancer in Zambia is 1.1:1.

3.1.3 Health-care facilities for diagnosing gastric cancer

Endoscopy is the reference standard for the diagnosis of gastric cancer. Endoscopy services are scarce in most African countries and serve only a limited proportion of the population [22]. This is due to the high cost of establishing, running, and maintaining endoscopy units in health-care systems that are poorly resourced.

Nigeria currently has 13 population-based cancer registries and 20 hospital-based cancer registries, including the cancer registry at Lakeshore Cancer Center, which is

dedicated to cancer prevention and treatment [23]. The Nigerian National Systems of Cancer Registries was established in 2009, in collaboration with the Federal Ministry of Health, the Society of Oncology and Cancer Research of Nigeria, and the Institute of Human Virology of Nigeria to provide technical and scientific support, training, and capacity development to cancer registries in Nigeria [24]. However, health-care facilities in Nigeria are inadequate, which limits the comprehensive detection of gastric cancer cases. Often, education and community advocacy for early case detection are not readily available [23]. The major contributing factor is a lack of funding for disease diagnosis, resulting in a lack of equipment and limited numbers of trained personnel. In addition, the maintenance of these population-based cancer registries is inadequate because of a paucity of resources. This makes it difficult to know the exact number of gastric cancer cases in Nigeria. Another limitation is that most cancer registries in Nigeria do not report on *H. pylori* infection (Table 3.1.1), so it is difficult to link *H. pylori* infection to gastric cancer in Nigeria. In addition, most cancer registries in Nigeria collect only basic sociodemographic data and data on the type of cancer, with a few clinical presentations. There is no follow-up of the patients included in the registries.

Table 3.1.1. Characteristics of included studies describing gastric cancer incidence and *H. pylori* testing in cities or regions in Nigeria

Reference	City or region	Study period	Cancer population in study	Gastric cancer cases	Histologically confirmed (%)	*H. pylori* tested?	Registry type	Age group
Abdulkareem et al. (2009) [16]	Lagos and Sagamu	1995–2006	713	78	100	No	Hospital/ laboratory	All
Abdulkareem et al. (2010) [5]	Lagos	1995–2007	105	95	100	Yes; 15.5%	Hospital	Adults
Afuwape et al. (2012) [25]	Ibadan	2004–2009	Only gastric cancer cases were reported	49	73.5	No	Hospital	Adults
Ahmed et al. (2011) [7]	Zaria	1995–2009	Only gastric cancer cases were reported	179	100	Yes; result not reported	Hospital	Adults
Alatise et al. (2007) [9]	Ile-Ife	1989–2005	230	160	100	Yes; 36.3%	Hospital	All
Arodiwe et al. (2013) [26]	South East	1995–2010	335	4	0	No	Hospital	Adults

Table 3.1.1. Characteristics of included studies describing gastric cancer incidence and *H. pylori* testing in cities or regions in Nigeria (continued)

Reference	City or region	Study period	Cancer population in study	Gastric cancer cases	Histologically confirmed (%)	*H. pylori* tested?	Registry type	Age group
Awodele et al. (2011) [27]	Lagos and Ibadan	2005–2009	5094	221	0	No	Hospital	All
Bakari et al. (2010) [11]	Maiduguri	1989–2005	87	72	100	Yes; 7%	Hospital	Adults
Ekanem and Parkin (2016) [28]	Calabar	2009–2013	719	9	100	No	Regional	All
Fapohunda et al. (2020) [23]	Lagos	2015–2018	548	9	0	No	Hospital	All
Habeebu et al. (2017) [19]	Lagos	2009–2016	106	8	100	No	Hospital	Adults
Irabor and Afuwape (2012) [17]	Ibadan	1990–2008	Only gastric cancer cases were reported	286	89	Yes; none seen	Hospital	All
Komolafe et al. (2008) [29]	Ile-Ife	10 years; period not specified	1038	102	100	Yes; 63%	Hospital	All
Mandong et al. (2010) [4]	Plateau State	1985–2004	5706	205	100	No	Hospital	All
Nwafor and Nwafor (2018) [30]	Akwa Ibom State	2007–2015	1186	45	100	No	Hospital	All
Ray-Offor and Obiora (2021) [31]	Port Harcourt	2012–2021	622	17	100	Yes; 5.9%	Hospital	Adults
Oluwasola and Ogunbiyi (2003) [32]	Ibadan	18 years; period not specified	Only gastric cancer cases were reported	84	100	Yes; 17.9%	Hospital	Adults

Zambia does not have a population-based cancer registry that covers the whole country, and this lack results in inadequate collection of data on gastric cancer [13]. Theoretically, there is a system that is designed to facilitate the diagnosis and reporting of gastric cancer cases in the country. Evaluation for suspected cases is initially done at first-level public and private facilities. Centres that offer endoscopy services perform this procedure, and those that do not offer endoscopy arrange for patients to be referred to health-care centres with more advanced facilities. After endoscopy, biopsies from

suspicious lesions are sent for histological diagnosis. Upon histological confirmation of the cancer, patients are referred to the Cancer Diseases Hospital, which is the only institution in Zambia that has comprehensive cancer treatment capabilities. Records from the Cancer Diseases Hospital are then directly recorded into the Zambia National Cancer Registry. There is also provision for the Zambia National Cancer Registry to obtain cancer-related data directly from individual health facilities. If working efficiently, this system would facilitate timely diagnosis of gastric cancer. However, research has shown that the movement of patients from one level of care to another is not efficient, resulting in delayed diagnosis and poor data collection [15].

In Nigeria, a recent 15-year prospective study of patients with gastric cancer in a tertiary hospital in the South West region showed that 94.2% of the patients underwent endoscopy, and, among the 138 patients in the study, diagnosis was carried out by abdominal ultrasonography in 57.9% of cases, computed tomography (CT) in 23.9% of cases, and magnetic resonance imaging (MRI) in 2.9% of cases [8]. Another study in the South West region of Nigeria reported that flexible endoscopy was the only diagnostic method in 34.7% of cases and that 26.5% of cases received a combination of endoscopy and a barium-meal test. For 24.5% of cases, the barium-meal test was the only diagnostic tool used, and 14.3% of cases were diagnosed intra-operatively [25].

A report from two endoscopy centres to which patients in the southern regions of Nigeria are referred showed that endoscopy was carried out to diagnose gastric cancer in a small set of patients [31]. A study in the North Central region showed that diagnosis of gastric cancer was based primarily on the barium-meal test, endoscopy, and biopsy; other diagnostic methods used were CT and ultrasonography [7].

3.1.4 *H. pylori* infection

Globally, the major risk factor for gastric cancer is *H. pylori* infection. The prevalence of *H. pylori* infection in Nigeria is 87.7% [33] and in Zambia is 79%, with most infections being acquired before the age of 10 years [34]. In Zambia, acquisition of *H. pylori* infection occurs earlier in urban settings than in rural settings [34]. This is probably due to the higher population density in urban and peri-urban areas than in rural areas, resulting in close human-to-human contact, which is often associated with inadequate living conditions and compromised sanitation. In contrast, in Nigeria the prevalence of gastric cancer is higher in rural areas than in urban areas.

In the face of very high levels of exposure, the associations between exposure and disease can be difficult to observe. This is exemplified by studies in Nigeria and Zambia that have attempted to show an association between *H. pylori* infection and gastric cancer.

In a case–control study in Zambia, 88% of gastric cancer cases and 87% of controls had detectable *H. pylori* antibodies; this difference was not statistically significant [35]. In a similar case–control study, 79% of gastric cancer cases and 88% of controls had *H. pylori* antibodies; this difference was also not statistically significant [36]. Another study in Zambia used a multiplex assay to measure 13 different *H. pylori* antibodies. None of these antibodies were detected at statistically significantly higher levels in gastric cancer cases than in controls [35]. Similarly, a study in Nigeria showed that *H. pylori* infection was detected in only 18% of gastric cancer tissue specimens [32]. A 10-year retrospective study of upper gastrointestinal endoscopy cases in the southern regions of Nigeria reported that among cases with histologically confirmed gastric cancer, *H. pylori* was detected in only 1 case [31]. However, these studies do not prove that *H. pylori* is not driving gastric cancer in these countries. Rather, they show that there is an urgent need to conduct more robust, and possibly prospective, studies that will demonstrate a clear link between *H. pylori* infection and gastric cancer. In addition, some of these studies had design limitations that could have affected the results.

3.1.5 *H. pylori* treatment

Treatment for *H. pylori* infection typically involves a combination of antibiotics and gastric acid-reducing drugs. Currently, there are no continent-wide guidelines for *H. pylori* treatment in Africa, and most countries in Africa rely on international strategies that are backed by evidence from outside the continent.

In Nigeria, *H. pylori* resistance to metronidazole, clarithromycin, and amoxicillin is high [37]. In a report published in 2017, resistance to metronidazole was 99.1%, to amoxicillin was 33.3%, and to clarithromycin was 14.4% [38]. In a report published in 2020, all the isolates tested were resistant to metronidazole, 25% were resistant to clarithromycin, and 30% were resistant to amoxicillin [37]. Metronidazole is widely available and widely used in Nigeria as an antidiarrhoeal or antiparasitic drug, and it is also used for gynaecological infections. Antibiotics are widely available to buy over the counter. Drugs sold over the counter are not regulated like prescription medications, and many people do not have health insurance that can pay the high cost of prescription

drugs. Therefore, self-prescription of antibiotics, which is associated with inappropriate dosing, is quite high in Nigeria [38], and this is a good recipe for the development of antimicrobial resistance.

In addition, Nigeria has limited facilities for *H. pylori* culture and sensitivity testing. Because of the high cost of culture, most physicians prescribe drugs empirically. The most prescribed regimen is triple therapy. There is growing evidence that quadruple concomitant therapy or levofloxacin triple therapy should replace clarithromycin triple therapy in regions where clarithromycin resistance is > 15% [39].

In Zambia, the burden of *H. pylori* antimicrobial resistance is thought to be high. In a recent study, the prevalence of resistance to clarithromycin was 28%, suggesting that this drug should not be prescribed empirically for *H. pylori* infection [40]. There is evidence of other common bacterial infections being resistant to amoxicillin and metronidazole in Zambia, and therefore this is probably true for *H. pylori* infections as well. Bismuth salts, which are currently the preferred additions to therapeutic regimens, are not available in Zambia. The use of rifabutin (an antimycobacterial drug) may have a negative effect on the control of the tuberculosis epidemic, with disastrous consequences. Therefore, options for effective *H. pylori* eradication in Zambia are limited. There is an urgent need to (i) collect robust evidence of sensitivity patterns, and (ii) generate evidence-based treatment guidelines for *H. pylori* infection in Zambia.

3.1.6 *H. pylori* treatment as a strategy for gastric cancer prevention

Eradication of *H. pylori* infection is a proven strategy for reducing the risk of gastric cancer. To find ways of appropriately closing the gaps in the treatment of *H. pylori* infection, the African *Helicobacter* and Microbiota Study Group (AHMSG), in collaboration with the European Registry on *Helicobacter pylori* Management, established the *H. pylori* Africa Registry (Hp-AfricaReg), which currently involves four African countries, including Nigeria and Zambia. The Hp-AfricaReg is an observational study in which data are being collected from patients who test positive for *H. pylori* infection using the urea breath test, the stool antigen test, or the simple urease test. The patients are treated using the local standard of care, and success of eradication is confirmed at least 4 weeks after the completion of *H. pylori* treatment. However, in both Nigeria and Zambia, many patients do not return for repeat tests after they have been treated; this limits the amount of data collected. Once completed, the Hp-AfricaReg

database will provide clear evidence-based information on treatment outcomes for *H. pylori* infection in at least four countries in Africa.

3.1.7 The African enigma

The so-called African enigma was first described by Holcombe more than 30 years ago [41]. It stated that despite the high prevalence of *H. pylori* infection in Africa, the occurrence of associated diseases, such as peptic ulceration and gastric cancer, was low. Since then, this description has served as a basis for many studies. However, it was not based on systematically collected evidence. Therefore, the African enigma is thought of as a medical myth by some scientists [42]. Holcombe did not account for variations in *H. pylori* prevalence among African populations and did not consider limitations in case detection.

Some of the data that were used to come up with the conclusion of the African enigma were from the northern regions of Nigeria, and no data from other regions of Nigeria or Zambia were used. Current data from Zambia do not support the concept of the African enigma. A community survey in a peri-urban, high-density community in Lusaka reported that the prevalence of peptic ulceration was similar to prevalences in countries outside Africa [43]. A recent study revealed that < 1% of adults with *H. pylori* infection had normal gastric mucosa, providing evidence that the infection was not indolent [21]. In addition, the exact burden of gastric cancer in Nigeria and Zambia remains unknown; therefore, concluding that it is rare might be erroneous.

The population prevalence of serologically diagnosed gastric atrophy (most of which is due to *H. pylori* infection) was 11% in Zambian adults aged 55–59 years [34]. This is lower than the prevalences reported in countries with a high incidence of gastric cancer, such as Japan (17% in the age group 40–60 years) [44] and the Republic of Korea (43% in the age group 40–49 years) [45]. However, it is higher than the prevalences reported in countries with a low incidence of gastric cancer, such as Germany (4.1% in the age group 55–59 years) [46] and Finland (3.5%) [47]. In a hospital-based endoscopy study in Lusaka, the prevalence of serologically determined gastric atrophy in all adult age ranges was 30% [36]. Serological diagnosis of gastric atrophy was done by measuring the pepsinogen I/II ratio. However, both studies used the cut-off value of 3.0, which was not validated for the Zambian population.

The lack of a clear congruence between prevalence of *H. pylori* infection and prevalence of related gastric diseases has also been reported in other parts of the

world, including Asia and Latin America [48]. Therefore, the use of the term “African enigma” in relation to *H. pylori* infection is redundant.

3.1.8 Efforts to improve information on gastric cancer

Cancer registries and strategic plans

On 26 May 2024, the Federal Ministry of Health and Social Welfare of Nigeria launched the National Cancer Registry Regulations for Nigeria. The aims were to improve access to real-time data (by reporting cancer cases to centralized registries), to promote early detection through timely diagnosis and intervention, to help mitigate the impact of cancer on individuals and communities, and ultimately to improve the quality of health-care delivery in Nigeria. The launch included the publication of a document developed by the National Institute for Cancer Research and Treatment, in collaboration with the African Cancer Registry Network, IARC, and St. Jude Children’s Research Hospital (USA). After the launch, the Federal Government of Nigeria intends to focus on tackling cancer by cancer prevention activities, advocacy, social mobilization, treatment, supply chain management, data management, research, and finance.

In Zambia, similar efforts have been made with the launch of the National Cancer Control Strategic Plan 2022–2026. To improve diagnostics, Zambia now has the capacity to train endoscopists to a high standard; so far, 10 local endoscopists (qualified physicians and surgeons) have been trained. Some of these endoscopists have since gone on to practise in various institutions within Zambia. However, the impact of these efforts is limited by a lack of endoscopy equipment in health-care centres outside of Zambia’s main cities. Therefore, the diagnosis of gastric cancer remains a challenge.

Finding cost-effective methods of diagnosing gastric cancer early

Attempts have been made to find simple, more cost-effective ways of diagnosing gastric cancer early, in the absence of endoscopy. A simple bedside device to detect blood in gastric juice before endoscopy has been designed and tested [49]. The device, called the Sanguis-filum, is an inert, absorbent string coiled up in a gelatin capsule. The capsule is swallowed, and the string is left in situ for at least 30 minutes. Upon retrieval of the string, guaiacum powder is used to test for the presence of blood on the string. This device was tested on 200 volunteers, with a reported high acceptance rate. The Sanguis-filum was found to not be sufficiently accurate for use as a diagnostic tool for gastric cancer, because it had a low sensitivity. This is probably because not all cancers

would be actively bleeding at any one time. Therefore, better results would probably have been achieved if the string had been left in situ for longer. Other efforts are currently under way in Zambia to find alternatives to the endoscopic diagnosis of early gastric cancer.

Understanding the molecular characteristics of gastric cancer

To reduce mortality from gastric cancer in Zambia, work is being done to understand its molecular characteristics. In one study in Zambia, the proportion of gastric cancers overexpressing human epidermal growth factor receptor 2 (HER2) was 23% [50]. Tumours with HER2 overexpression respond to targeted therapy with the anti-HER2 antibody trastuzumab, and this approach is associated with improved survival [51]. Because Zambia has a high number of cases of advanced gastric cancer, routinely testing for HER2 may have a substantial impact on outcomes.

There is also evidence that a high proportion of gastric cancers exhibit loss of MutL homologue 1 (MLH1) expression, which is a marker of microsatellite instability [52]. This could be vital for future precision therapeutic approaches.

Programmed death ligand-1 (PD-L1) is an immune checkpoint inhibitor that is a promising prognostic and therapeutic target for gastric cancer. In a recent study in Zambia, the expression of anti-PD-L1 was evaluated in gastric cancers. Positive expression was detected in 14% of cases. This approach may improve the outcomes of patients with advanced gastric cancer in Zambia [53].

3.1.9 Future directions

Evidence shows that countries that have rolled out screening programmes for gastric cancer have higher detection rates and better outcomes for gastric cancer [54]. Currently, screening for gastric cancer is not possible in Africa. Work is under way to find affordable and applicable ways of either diagnosing gastric cancer early or preventing it altogether using effective *H. pylori* eradication. Because there is evidence that *H. pylori* infection is prevalent in Africa, the AHMSG was formed to spearhead activities and conduct high-quality research to provide evidence-based answers to the questions on *H. pylori*-induced gastric cancer in Africa.

The AHMSG currently has 16 board members from 10 African countries and several other members from 8 other countries. Several projects have been identified and will be

conducted within the AHMSG as funding becomes available. These are briefly described here.

Project 1: Understanding the true burden of H. pylori *infection and gastric cancer in Africa*

Very few countries in Africa have done population-wide studies on the prevalence of *H. pylori* infection. The model that was recently used in Zambia, in which archival blood samples from a Population-Based HIV Impact Assessment (PHIA) were used to accurately determine the national prevalence of *H. pylori* infection, could be used in other African countries. The PHIA project was supported by the United States President's Emergency Plan for AIDS Relief (PEPFAR) through the United States Centers for Disease Control and Prevention. The PHIA project has a presence in 15 African countries, including Nigeria. The PHIA survey had the resources to carry out systematically sampled door-to-door blood collection to study the burden of HIV. The AHMSG will use these stored samples to measure the presence of *H. pylori* antibodies and thereby determine the national prevalence of *H. pylori* infection in 15 countries in Africa. The AHMSG will also work in close liaison with diagnostic centres and cancer registries in Africa to understand the true burden of gastric cancer and *H. pylori*-related disease in the continent.

Project 2: A comprehensive survey of the available resources in AHMSG member countries

One of the limiting factors for information gathering in Africa is the lack of capacity to conduct credible research. The AHMSG recently conducted and published a survey on practices related to *H. pylori* treatment in Africa [55]. There are also plans to conduct another study, focused on research resources, to understand which centres can effectively collect and store biological samples and also perform culture and sensitivity testing.

Project 3: Evaluating the profile of antimicrobial resistance in the continent, with a specific focus on multidrug resistance and heteroresistance

The AHMSG is preparing a grant application aimed at determining the burden of antimicrobial resistance in Africa. This ambitious project will cover several African countries, providing robust data on *H. pylori* resistance.

Project 4: Participating in the Hp-AfricaReg

This descriptive observational study is collecting information on patient outcomes after treatment with the currently available standard of care. Four African countries have started the study.

Project 5: Multicentre randomized clinical trials

The information gathered from Project 3 and Project 4 will be used to design multicentre randomized clinical trials in Africa. This information will enable the formulation of evidence-based treatment guidelines that are applicable to Africa.

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